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(54) Title of the invention: Semiconductor film formation method

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Specification

1. Title of Invention

Semiconductor film formation method

2. Claims

A semiconductor film formation method characterized by forming an Si film on a substrate by thermo-decomposition or photodecomposition of a source material of n=3 or more silane (Si_nH_{2n+2}) such as trisilane (Si_3H_8) and tetrasilane (Si_4H_{10}).

3. Detailed Explanation of the Invention

Field of Industrial Utilization

The present invention is related to a method to form an Si semiconductor film, and in particular, the present invention is related to the source material thereof.

Prior Art

In the past, Si semiconductor films were commonly formed by the thermo-decomposition method, the photodecomposition method, or the plasma CVD method using monosilane (SiH_4) or disilane (Si_2H_6) as the source material.

Problems to Be Solved by the Invention

However, when using the aforementioned conventional technology, in order to form a polycrystal Si film on an insulating substrate, the problems were that it was necessary to heat the substrate to 600°C or more, and it was necessary for the substrate temperature to be 500°C or more in order to epitaxially grow monocrystal Si film on an Si monocrystal substrate.

The present invention resolves the problems of the conventional technology, and has the purpose of offering a source material wherein a polycrystal Si film can be formed on an insulating substrate at about 400°C or less, and even at about 100°C, and in which an Si monocrystal film can be epitaxially grown on an Si monocrystal substrate at about 200°C or less, and even at about 100°C.

Means to Resolve the Problems

In order to resolve the aforementioned problems, the present invention is related to a semiconductor film formation method, and is a means to form an Si film on a substrate by thermo-decomposition or photodecomposition etc. of a source material of n=3 or more silane (Si_nH_{2n+2}) such as trisilane (Si_3H_8) and tetrasilane (Si_4H_{10}).

Embodiments

The present invention will be explained in detail below using an embodiment.

When forming a polycrystal Si film on a Pyrex glass substrate, if the source material is Si_3H_8 or Si_4H_{10} and formation is conducted by the CVD method, a polycrystal Si film with a particle size of 3 μm can be formed at a substrate temperature of 400°C, and the load mobility in a TFT using said Si film becomes large, and high speed operation becomes possible. Further, it is possible to obtain the same polycrystal even when irradiating the surface of the substrate with ultraviolet rays to make a substrate temperature of 100°C.

Next, when allowing monocrystal Si film to epitaxially grow on a monocrystal Si substrate using Si_3H_8 or Si_4H_{10} as the source material, it is possible to conduct this growth at a substrate temperature of 100°C by irradiation with ultraviolet rays, or by making plasma.

Further, it goes without saying that an amorphous Si film can be easily formed on a substrate by using the CVD method with a source material of Si_3H_8 or Si_4H_{10} at a temperature of about 400°C or less, or even at about 100°C or less.

Effects of the Invention

The present invention has the effect of making polycrystal Si film growth and epitaxial growth that indicate high mobility at a low temperature.

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